


8/4/05 CO

MEMORANDUM

INTERMOUNTAIN POWER SERVICE CORPORATION

TO: G. Mike Alley Page 1 of 1

FROM: Dennis K. Killian 

DATE: August 3, 2005

SUBJECT: Recommendation for replacement of Fabric Filter Bags

We recommend that Maintenance Budget for replacement of the Fabric Filter Bags in the next three to four years.

This recommendation is based on recent bag testing (see attached reports). Two bags were removed from Unit 2 compartment 1B07 and two bags from Unit 2 compartment 1B09. These compartments had the oldest "rebag" dates without any individual filter bag replacements. This selection criteria eliminated the possibility of testing on a bag only recently replaced. One bag from each compartment was sent to one of two labs. The testing performed by the labs shows good correlation, indicating credible results.

Estimates by the labs place the remaining usable life of the filter bags at approximately 30 percent. This estimate would dictate replacement in 2009. However, these estimates do not account for the increased flows due to unit uprates or recent changes in fly ash properties. In addition, starting in 2009 would initiate the replacement in Unit 1, which has the newest filter bags. A conservative approach starts the replacement in 2008 beginning with Unit 2.

Unit 1 testing is scheduled to be completed on Work Orders 05-62723 and 05-62724. Results from the Unit 1 tests, which may indicate more immediate attention, will be forwarded.

Any questions regarding the testing may be directed to Bret Kent at ext. 6447

BK/JKH:jmj

Attachments (2)

cc: George W. Cross
Jon A. Finlinson
Joe D. Hamblin

IP12_001438

Environmental Consultant Company

dedicated to filtration science...

Laboratory Address:
2501 W. Behrend Drive, Suite 77
Phoenix, Arizona 85027

Mailing Address:
P.O. Box 42537
Phoenix, Arizona 85080

April 1, 2005

TLN 7421

Page 1

REPORT INTERMOUNTAIN POWER SERVICE CORPORATION

Reference: Unit 2 Bag Evaluations

Two reverse air cleaning filter bags were received for testing and evaluations. The bags were in the same bag/box with the following outside labels: Unit 2 - 2B07 and Unit 2 - 2B09.

The bags have been in service from 10/96 and 9/97.

The specific location of the individual bags was not identified hence, bags can only be assigned as from Unit 2 with projected service use.

These bags yielded nominal levels of as received permeability readings. Examination of the fly ash cake structure revealed a generally porous formation with no significant level of agglomerations.

Photo A and B are views common to the full profile of the bags.

Telephone: 623-582-5155
Fax: 623-581-9264

Email: eccl@bagtest.com
Website: www.bagtest.com



IP12_001439

April 1, 2005

TLN 742 J

Page 3

There is no significant differences in nodula population indicative of no moisture encounters having occurred since the 10/96 installation date.

Cleaning flows generated good overall discharge characteristics with good elevations in permeability throughput.

The levels are common to both bags further indicative of no abnormal condition from the first 10/96 installation operating period to date.

Examination of the lines of collapse revealed good equal distant spacing and intensity resulting from good upward tensioning and good cleaning reverse air flow distribution through the compartments.

The media is at good ash collection characteristics with no significant fine micron dust penetration.

Photo C and D are views of the clean air side of the bags revealing very minimal levels of dust penetration.



Photo C



Photo D

Breaking strengths and mullen burst values are all at good levels of retention.

Flex cycles also indicative good levels of endurances.

These bags are rated at 65% to 70% maximum termination levels indicative of good further service use potential.

No abnormal wear or bag to bag contact is demonstrated.



prepared for **INTERMOUNTAIN POWER**

Date **4/1/2005**

TLN **742 J**

Identification: **UNIT 2-1**

Fiber Content: **ECDE**

Fabric Construction: **WOVEN**

Weave **3 X 1 TWILL**

Count **44 X 24**

Yarn System- Warp/Length: **37-1/0F**

Filling Width: **75-1/2T+75-1/0F**

Avg. Weight (oz/sq yd): **13.68**

Thickness (inches): **.015**

Density Factor: **.704**

Treatment- Physical Type: **NONE**

Chemical Type:

% Ignition Loss (LOI):

500° F/1 Hour: **0.07%**

1150° F/1 Hour: **4.42%**

% Extractable Matter: **SULPHATES**

Acid Alkaline (PH): **9.93**

Fabrication =====>

Seaming **CHAIN**

Hardware: **CR**

Cuffing **LOCK**

Sewing Thread: **E GLASS**

Ring Cover: **LOCK**

Fabrication Rating: **GOOD**

-PROFILE DATA-

		Top	Center	Bottom
Weight (oz/sq yd)	As Received	23.74	23.46	23.29
	Cleaned	19.51	19.37	19.11
	Cleaned - Washed	13.68	13.65	13.69
Permeability CFM/sq ft @ .5" H2O	As Received	2.91	2.99	3.08
	Cleaned	6.8	7.0	7.6
	Cleaned - Washed	43.7	44.9	42.0
Breaking Strength lbs/inch	Warp/Length	283	284	229
	Filling/Width	165	163	153
Breaking Strength Percent Loss	Warp/Length	43.40%	43.20%	54.20%
	Filling/Width	52.85%	53.43%	56.86%
Mullen Burst (lbs/sq inch)		359	362	347
Mullen Burst (percent Loss)		52.13%	51.73%	53.73%
Flex Cycles (MIT Method)	Warp	18314	17981	16938
	Filling	4196	4226	3679
Flex Cycles Percent Loss	Warp	63.37%	64.04%	60.12%
	Filling	58.01%	57.74%	63.21%
Other Testing				

IP12_001442



Prepared for: **INTERMOUNTAIN POWER**

Date: **4/1/2005**

TLN: **742 J**

Identification: **UNIT 2-2**

Fiber Content: **ECDE**

Fabric Construction: **WOVEN**

Weave: **3 X 1 TWILL**

Count: **44 X 24**

Yarn System- Warp/Length: **37-1/0F**

Filing Width: **75-1/4F→75-1/2T**

Avg. Weight (oz/sq yd): **13.54**

Thickness (inches): **.014**

Density Factor: **.745**

Treatment- Physical Type: **NONE**

Chemical Type: **AR**

% Ignition Loss (LOI):

500° F/1 Hour: **0.11%**

1150° F/1 Hour: **4.63%**

% Extractable Matter: **SULPHATES**

Acid/Alkaline (PH): **10.01**

Fabrication: **CR**

Seaming: **CHAIN**

Hardware: **CR**

Cuffing: **LOCK**

Sewing Thread: **E GLASS**

Ring Cover: **LOCK**

Fabrication Rating: **GOOD**

PROFILE DATA

		Top	Center	Bottom
Weight (oz/sq yd)	As Received	23.88	23.64	23.51
	Cleaned	19.60	19.41	19.28
	Cleaned/Washed	13.51	13.68	13.44
Permeability CFM/sq ft @ 5" H ₂ O	As Received	2.74	2.83	3.00
	Cleaned	6.7	6.9	7.5
	Cleaned/Washed	47.5	47.1	48.3
Breaking Strength lbs/inch	Warp/Length	284	261	217
	Filing/Cuff	168	157	147
Breaking Strength Percent Loss	Warp/Length	47.00%	47.80%	56.60%
	Filing/Cuff	55.43%	55.14%	58.00%
Mullen Burst (lbs/sq inch)		349	351	337
Mullen Burst (percent Loss)		53.47%	53.20%	55.07%
Flex Cycles (MIT Method)	None	17421	16943	15838
	100	4070	3753	3049
Flex Cycles Percent Loss	None	65.16%	66.11%	68.32%
	100	59.30%	62.47%	69.51%
Other Testing				

IP12_001443

Laboratory Report

Date: June 30, 2005

Total Pages: four (4)

Prepared by: Joe Stieber

Report #4094

Send To . . . **Name:** Brett Kent
 Company: INTERMOUNTAIN POWER SERVICE CORP.
 Location: Delta, Utah

Subject: Purchase Order No. 05-43596, Used Filter Bag Testing

Request and Sample Description

Two (2) used woven fiberglass, reverse-gas filter bags were submitted for analysis of their general conditions, permeability and strength with regard to remaining life. These bags were in service on flue gas from a coal-fired boiler for nearly ten years (installed in 1996?). There have been a few sporadic failures and ΔP is "ok" (5 to 7" with continuous cleaning).

Summary and Comments

The two bags were labeled "U-2, IB-09." To differentiate them, we arbitrarily designated them #1 and #2. As received, both ends of each bag had already been cut off (to facilitate removal?). Otherwise, both were in good physical condition with no failures present or any significant wear evident. Correspondingly, the Mullen burst strength was still fairly high at 385 and 358 psi (net) for #1 and #2 respectively. Considering they have nearly ten years of service life, there is no reason to expect deterioration that would precipitate failures in the foreseeable future if operating conditions remain largely the same.

Because of dust spillage into the plastic shipping bag, there was considerable dust contamination of the external surface. We are not sure what effect this would have had on the measured permeability, so we lightly brushed the exteriors before permeability measurement. The dirty permeability averaged 1.20 and 1.30 cfm for #1 and #2 respectively. This is a little lower than the nominal 2 cfm for typical used and normally-operating large reverse-gas bags, but still above the 1 cfm threshold for blinding. Therefore, if the current pressured drop is satisfactory, permeability would not dictate replacement.

MEASUREMENTS AND OBSERVATIONS

Identification

The two used filter bags were packed in a single plastic bag that was tagged "U-2, 1B-09."

At the top edge, both filter bags were labeled "1B-09" (in handwriting). We arbitrarily designated them #1 and #2.

After vacuuming, we found the following bag manufacturer's stamps at the top:

#1) 325 1441	#2) 325 1442
REV B	REV B
7AS 13	DHW 8

These appear to be BHA stamps. Note: the final "2" in 1442 of Bag #2 was overwritten in handwriting with a magic marker (over what appears to have been originally a "1").

Observations

As received, both ends of both bags had already been cut off during (or after) removal judging from the fresh, jagged edges that remained at each end. Therefore, with no caps present, considerable dust spilled into the plastic shipping bag. As a result, the exteriors of the bags were quite dusty as received.

Because of the missing ends and the considerable dust contamination, we did not weigh the bags, but with a shipping weight of 69 lb for the pair, the net weight for the filter bags was probably about 60 lb, or 30 lb each, which would not be atypical of large reverse-gas filter bags we examine. However, those bags usually have both ends remaining, so there would be less dust lost on handling (not to mention the weight of the cuffs and caps that were missing on the subject bags).

The remaining portion of each bag (about 31 to 32 ft long) was fabricated the same. The flat width was nominally 19-1/8" (indicating a nominal 12" diameter). The vertical seam was felled with triple needle chain stitching. There were eight (8) expansion rings, each with a double layer, self-material ring cover. The rings were progressively spaced, so we assumed the end with the closest-spaced rings was the bottom and the end with the widest-spaced rings was the top. The rings themselves were not rusty (they looked as if they were plated).

Ignoring that the ends had been cut off, both bags were in good physical condition with no failures present and with no significant wear evident.

Internally, each bag had a moderate residual cake of medium to light-gray-colored dust with no crust or nodulation. The dust itself seemed fine, but also finely gritty when rubbed on a hard surface. Before measuring the permeability, we lightly brushed the external surfaces

(it is difficult to say if the dust would have had a meaningful effect on the measured values or if brushing was effective at minimizing any such effect).

Fabric Physical Characteristics

By inspection of the vacuumed samples, the fabric of each bag was a nominal 13.5 oz/yd² woven fiberglass:

Weave:	3 × 1 left-hand twill, warp face out
Count:	44 × 24 per inch, warp × fill
Yarn, warp: fill:	37 1/0 75 2/0 textured + 75 1/0
Finish:	pale gray color (looks like faded BGF "625" acid-resistant finish)

Permeability Profile (cfm/ft² @ 0.5" w.g.; average of three measurements at each location)

<i>Dirty</i>	#1	#2
Top:	1.01	1.25
Middle:	1.20	1.05
Bottom:	1.38	1.61
O.A. Average:	1.20	1.30

<i>Vacuumed</i>	#1	#2
Top:	21.5	26.1
Middle:	23.3	22.4
Bottom:	24.8	32.6
O.A. Average:	23.2	27.0

Mullen Burst Profile (lb/inch² net, tare = 40; average of three
measurements at each location)

<i>Vacuumed</i>	#1	#2
Top:	375	353
Middle:	389	358
Bottom:	391	364
O.A. Average:	385	358

Laboratory Report

Date: March 17, 2006

Total Pages: five (5)

Prepared by: Joe Stieber

Report #4182

Send To . . . Name: Bret Kent

Company: INTERMOUNTAIN POWER SERVICE CORP.

Location: Delta, Utah

Subject: Purchase Order No. 05-43596; Used Filter Bag Testing, Unit #1

Request and Sample Description

Two (2) used woven fiberglass filter bags were submitted for standard testing to determine the remaining life. These bags were in service on fly ash from a coal-fired boiler. The bag from 1A08 was installed in April of 1998 (about 89 months of service when they were received at GFTS in September 2005) and the bag from 1A09 was installed in May of 1997 (about 100 months of service). No operating problems were reported.

Summary and Comments

Presumably, since there were no reports to the contrary, the bags are currently operating satisfactorily (and that is what we would expect that based on our laboratory analysis).

Both bags were in good physical condition with no failures present or impending, and there was no significant wear evident. Although the washed fabric from 1A09 was a pale gray color vs. a silver-gray color for the washed fabric from 1A08, both seemed to be the basic color of "acid-resistant" finish. More importantly, the ignition loss values of 4.90 and 4.95% for 1A08 and 1A09 were close to the nominal 5% level we would expect for acid-resistant finish (i.e., the long service does not appear to have caused any meaningful dissipation of the protective finish, even if the color was a little blanched).

Correspondingly, the average Mullen burst was still high at 375 and 377 psi (net) for the bags from 1A08 and 1A09 respectively. For woven fiberglass bags, we consider 200 psi to be the threshold of concern. Two bags from Unit #2 tested on previous report #4094 (dated June 30, 2005) were similar at 385 and 358 psi (net).

We do not know if any (or how much) loose dust was intentionally emptied from these bags before shipment to GFTS, but they had moderate as-received weights (27.3 and 25.8 lb for 1A08 and 1A09) and just modest piles of dust (4.5 and 4.0 lb) were “milked out” of them. Afterwards, by visual inspection, both had a moderate residual dust cake with no crust or nodulation.

The dirty permeability of 1A08 averaged 3.10 cfm and 1A09 averaged 1.79 cfm. 1A08 is distinctly higher than the nominal 2 cfm level we would expect for a normally-operating, used and dirty reverse-gas bag. 1A09 is comparable to the nominal level. 1A08 was also somewhat higher in vacuumed permeability (31.0 vs. 19.8 cfm) and after washing (67.0 vs. 58.7 cfm).

There was no apparent reason why 1A08 should be higher in permeability, especially since the washed fabric physical characteristics were so similar. In any case, the permeabilities were average to better-than-average so they should not represent an operational problem if the cleaning cycle is effective at removing the in-situ cake buildup. In contrast, the bags from the previous report averaged just 1.20 and 1.30 cfm dirty, but 23.2 and 27.0 cfm after vacuuming.

Predicting remaining bag life can be precarious, especially when we don't know the current operating status. However, assuming current operation is satisfactory, and in view of the good condition of the submitted bags, another two years of service (or more) would not be an unreasonable expectation if operating conditions remain largely the same.

MEASUREMENTS AND OBSERVATIONS

Identification

The used filter bags were packed in separate plastic bags that were tagged:

A80	1A8
	0-10

A90	1A9
	0-10

We will subsequently refer to them simply as #8 and #9. We found the following bag manufacturer's stamp at the top of each bag:

#8: 325 1441
REV C
DW 24

#9: 325 1442
REV C
WD 14

Dimensions

	#8	#9
Bag Weight		
As Received:	27.3 lb	25.8 lb
Dust "milked out":	4.5 lb	4.0 lb
Dirty bag:	22.8 lb	21.8 lb
Length		
Seam:	394-7/8"	394-3/4"
Opposite:	395-1/8"	394-1/2"
Flat Width		
Top:	19-3/16"	19-3/16"
Middle:	19-1/4"	19-3/16"
Bottom:	19-1/4"	19-1/4"

Fabrication Details

Both bags were similarly fabricated. The top had an integral compression band cuff with a steel cap installed. The cap of #8 had a patina of reddish-bronze color, but it was not rusty. The cap of #9 was a dull metallic gray color. The vertical seam was felled with triple needle chain stitching. Each had eight (8) progressively-spaced expansion rings. Each ring had a double layer self-material ring cover attached with two rows of double needle lock

stitching. The rings themselves were not rusty; instead, they were a metallic gray color (as if they were plated). The bottom had a 2-1/4" integral compression band cuff.

Observations

Externally, both bags were lightly dusty as received; however, much of this external dust was likely contamination that occurred after removal (in particular, from being stuffed inside the plastic shipping bags).

After a modest pile of loose dust was "milked" from each bag (by gently raising the laid-flat bag progressively from top to bottom), each had a moderate to light residual cake of dark, tannish-gray dust with no crust or nodulation.

The pH of a 5 g mixture of dirty fabric from the middle of each bag in 100 ml of distilled water was mildly alkaline:

#8: 8.62

#9: 9.24

Both bags were in good physical condition with no failures present and with no significant wear evident.

Fabric Physical Characteristics (washed middle samples)

	#8	#9
Weave:	3×1 left-hand twill, warp out	
Count:	44 × 24 per inch, warp × fill	
Yarn warp: fill:	37 1/0 75 2/0 textured + 75 1/0	
Weight:	13.63 oz/yd ²	13.71 oz/yd ²
Permeability:	67.0 cfm	58.7 cfm
Finish color: ignition loss:	silver-gray 4.90%	pale gray 4.95%

Permeability Profile (cfm/ft² @ 0.5" w.g.; average of three measurements at each location)

<i>Dirty</i>	<i>#8</i>	<i>#9</i>
Top:	2.32	1.58
Middle:	2.45	1.82
Bottom:	4.52	1.97
O.A. Average:	3.10	1.79

<i>Vacuumed</i>	<i>#8</i>	<i>#9</i>
Top:	29.5	18.3
Middle:	30.9	20.2
Bottom:	32.7	21.0
O.A. Average:	31.0	19.8

Mullen Burst Profile (lb/inch² net, tare = 35; average of three measurements at each location)

<i>Vacuumed</i>	<i>#8</i>	<i>#9</i>
Top:	379	375
Middle:	374	372
Bottom:	373	383
O.A. Average:	375	377

Laboratory Report

Date: June 30, 2005

Total Pages: four (4)

Prepared by: Joe Stieber

Report #4094

Send To . . . **Name:** Brett Kent
 Company: INTERMOUNTAIN POWER SERVICE CORP.
 Location: Delta, Utah

Subject: Purchase Order No. 05-43596, Used Filter Bag Testing

Request and Sample Description

Two (2) used woven fiberglass, reverse-gas filter bags were submitted for analysis of their general conditions, permeability and strength with regard to remaining life. These bags were in service on flue gas from a coal-fired boiler for nearly ten years (installed in 1996?). There have been a few sporadic failures and ΔP is "ok" (5 to 7" with continuous cleaning).

Summary and Comments

The two bags were labeled "U-2, 1B-09." To differentiate them, we arbitrarily designated them #1 and #2. As received, both ends of each bag had already been cut off (to facilitate removal?). Otherwise, both were in good physical condition with no failures present or any significant wear evident. Correspondingly, the Mullen burst strength was still fairly high at 385 and 358 psi (net) for #1 and #2 respectively. Considering they have nearly ten years of service life, there is no reason to expect deterioration that would precipitate failures in the foreseeable future if operating conditions remain largely the same.

Because of dust spillage into the plastic shipping bag, there was considerable dust contamination of the external surface. We are not sure what effect this would have had on the measured permeability, so we lightly brushed the exteriors before permeability measurement. The dirty permeability averaged 1.20 and 1.30 cfm for #1 and #2 respectively. This is a little lower than the nominal 2 cfm for typical used and normally-operating large reverse-gas bags, but still above the 1 cfm threshold for blinding. Therefore, if the current pressured drop is satisfactory, permeability would not dictate replacement.

MEASUREMENTS AND OBSERVATIONS

Identification

The two used filter bags were packed in a single plastic bag that was tagged "U-2, 1B-09."

At the top edge, both filter bags were labeled "1B-09" (in handwriting). We arbitrarily designated them #1 and #2.

After vacuuming, we found the following bag manufacturer's stamps at the top:

#1) 325 1441	#2) 325 1442
REV B	REV B
?AS 13	DHW 8

These appear to be BHA stamps. Note: the final "2" in 1442 of Bag #2 was overwritten in handwriting with a magic marker (over what appears to have been originally a "1").

Observations

As received, both ends of both bags had already been cut off during (or after) removal judging from the fresh, jagged edges that remained at each end. Therefore, with no caps present, considerable dust spilled into the plastic shipping bag. As a result, the exteriors of the bags were quite dusty as received.

Because of the missing ends and the considerable dust contamination, we did not weigh the bags, but with a shipping weight of 69 lb for the pair, the net weight for the filter bags was probably about 60 lb, or 30 lb each, which would not be atypical of large reverse-gas filter bags we examine. However, those bags usually have both ends remaining, so there would be less dust lost on handling (not to mention the weight of the cuffs and caps that were missing on the subject bags).

The remaining portion of each bag (about 31 to 32 ft long) was fabricated the same. The flat width was nominally 19-1/8" (indicating a nominal 12" diameter). The vertical seam was felled with triple needle chain stitching. There were eight (8) expansion rings, each with a double layer, self-material ring cover. The rings were progressively spaced, so we assumed the end with the closest-spaced rings was the bottom and the end with the widest-spaced rings was the top. The rings themselves were not rusty (they looked as if they were plated).

Ignoring that the ends had been cut off, both bags were in good physical condition with no failures present and with no significant wear evident.

Internally, each bag had a moderate residual cake of medium to light-gray-colored dust with no crust or nodulation. The dust itself seemed fine, but also finely gritty when rubbed on a hard surface. Before measuring the permeability, we lightly brushed the external surfaces

(it is difficult to say if the dust would have had a meaningful effect on the measured values or if brushing was effective at minimizing any such effect).

Fabric Physical Characteristics

By inspection of the vacuumed samples, the fabric of each bag was a nominal 13.5 oz/yd² woven fiberglass:

Weave:	3 × 1 left-hand twill, warp face out
Count:	44 × 24 per inch, warp × fill
Yarn, warp: fill:	37 1/0 75 2/0 textured + 75 1/0
Finish:	pale gray color (looks like faded BGF “625” acid-resistant finish)

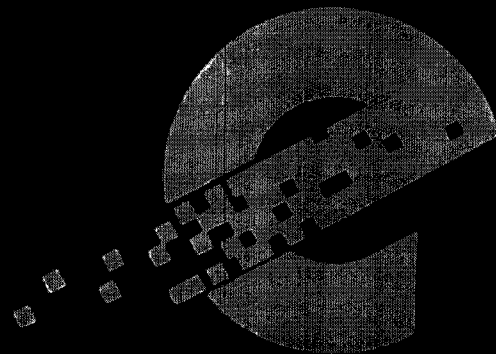
Permeability Profile (cfm/ft² @ 0.5" w.g.; average of three measurements at each location)

<i>Dirty</i>	<i>#1</i>	<i>#2</i>
Top:	1.01	1.25
Middle:	1.20	1.05
Bottom:	1.38	1.61
O.A. Average:	1.20	1.30

<i>Vacuumed</i>	<i>#1</i>	<i>#2</i>
Top:	21.5	26.1
Middle:	23.3	22.4
Bottom:	24.8	32.6
O.A. Average:	23.2	27.0

Mullen Burst Profile (lb/inch² net, tare = 40; average of three measurements at each location)

<i>Vacuumed</i>	<i>#1</i>	<i>#2</i>
Top:	375	353
Middle:	389	358
Bottom:	391	364
O.A. Average:	385	358



Environmental Consultant Company

Prepared For:

**Intermountain Power Service Corp
Delta, Utah
10/19/2005
TLN 140K**

Environmental Consultant Company

dedicated to filtration science...

Laboratory Address:
2501 W. Behrend Drive, Suite 51
Phoenix, Arizona 85027

Mailing Address:
P.O. Box 42537
Phoenix, Arizona 85080

10/19/05
TLN 140K
Page 1

Report Intermountain Power

Reference: Bag evaluation (TLN – 291c)

Purpose of test:

Two reverse air cleaning filter bags were received for testing and evaluation.

The bags were identified as follows:

A 8 - I - 0 - 11
A 9 - I - 0 - 11

Testing Results:

The results of the testing data are attached.

The as received Permeabilities in both bags have declined slightly over previous bag data (TLN 291C) Unit 1.

Examination of the ash cake revealed dust agglomeration generating reduced voids for the flow throughput.

Photo A and Photo B are microscopic views of the as received ash cake revealing the dense agglomerated ash with resulting low voids within the cake structure.

Telephone: 623-582-5155
Fax: 623-581-9264

E-mail: ecc@bagtest.com
Website: www.bagtest.com



IP12_001458

October 19, 2005
TLN 140K
Page 2

Photo A

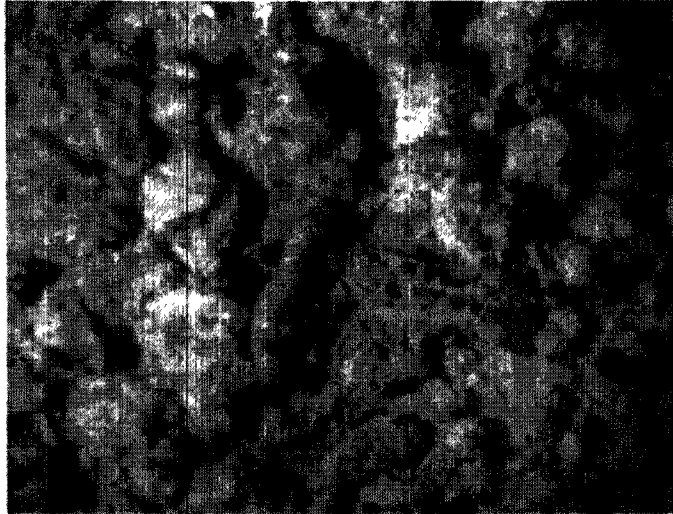
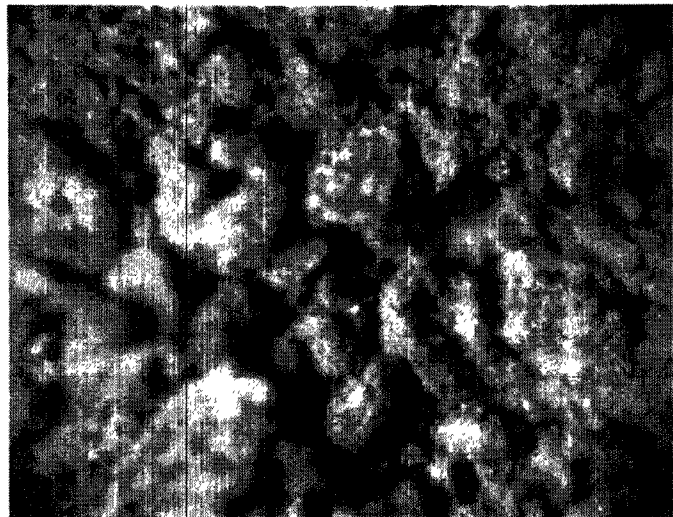


Photo B



Bag 1-A*-0-11 is at low flows/higher nodula than bag 1-A9-0-11 however both contain the agglomerated cake formation.

Previous data indicates Unit 1 has sonic assist.

The use of sonic assist will improve the level of discharge exhibited by these bags under RA flows only discharge is hampered from fiber encapsulation (Photo C).

Photo C



Extractions of the nodula revealed moisture induced hygroscopic sulphates as the binding force (calcium sulphate).

Moisture could be sourced from boiler tube leaks, dew point encounters and/or faulty soot blowing allowing condensation.

Physical strengths both breaking and mullen burst are at generally good levels of retention in full profile.

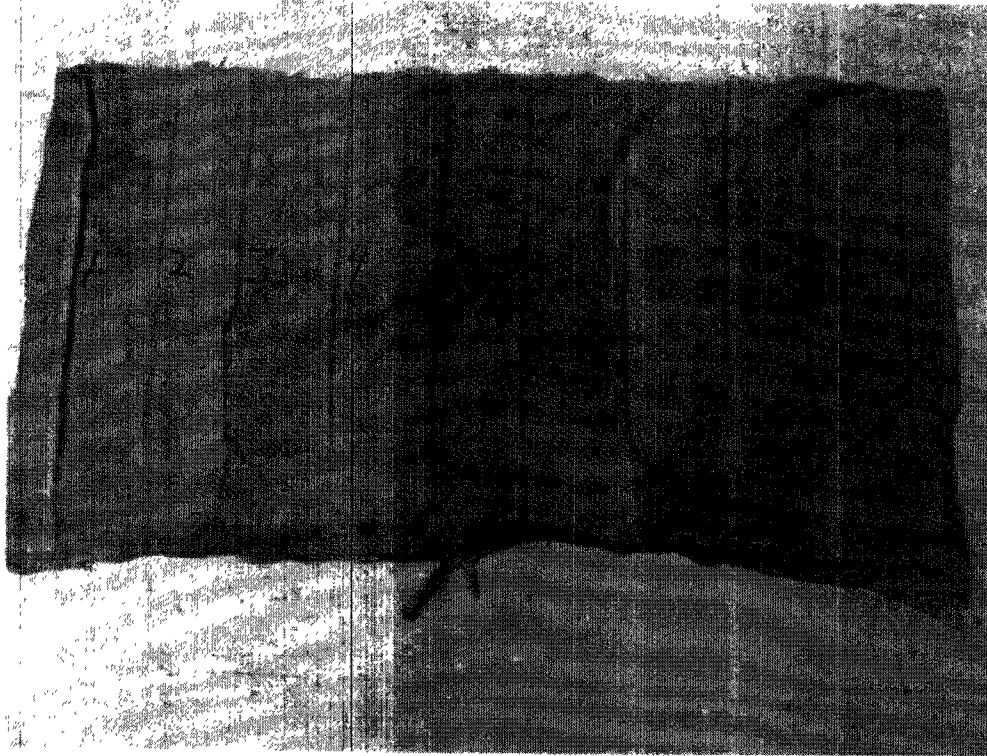
There is no chemical or thermal deterioration present on these bags.

All losses have resulted from normal service use fatigue.

Both bags have good lines of collapse in full length indicative of good upward tension.

Photo D is a view of the lines of collapse common to both bags.

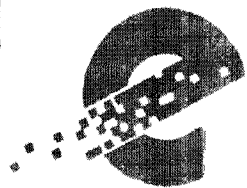
Photo D



These vertical lines form under the reverse air/ collapse geometry of the bag into star shaped pattern.

With good specific line intensity and spacing around the circumference, good upward tensioning is indicated on the bags.

The bag 1-A8-0-11 is rated at 65% terminated and bag 1-A9-0-11 is rated at 70% terminated indicative of good continued service use potential on both bags.

prepared for. **INTERMOUNTAIN POWER**Date : **10/19/200**TLN : **140K**Identification: **1 A8-0-11**Fiber Content: **ECDE**Fabric Construction: **WOVEN**Weave: **3 X 1 TWIL**Count: **44 X 24**Yarn System- Warp/Length: **37-1/0F**Filling Width: **75-1/0F+75-1/2T**Avg. Weight [oz/sq yd] **13.56**Thickness [inches]: **.015**Density Factor: **0.698**Treatment- Physical Type: **NONE**Chemical Type: **ACID RESISTANT**

% Ignition Loss [LOI]:

500° F/1 Hour: **0.08%**1150° F/1 Hour: **4.46%**% Extractable Matter: **SULPHATES**Acid Alkaline [PH]: **10.74**

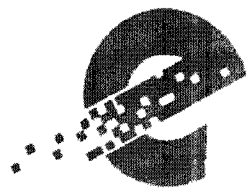
Fabrication ==

Seaming: **CHAIN**Hardware: **C.R.**Cuffing: **LOCK**Sewing Thread: **E GLASS**Ring Cover: **LOCK**Fabrication Rating: **GOOD**

-PROFILE DATA

		Top	Center	Bottom
Weight (oz/sq yd)	As Received	21.92	21.82	21.11
	Cleaned	18.09	17.69	17.55
	Cleaned (Washed)	13.54	13.58	13.57
Permeability CFM/sq ft @ .5" H2O	As Received	1.03	1.28	1.37
	Cleaned	4.5	4.6	5.0
	Cleaned (Washed)	55.3	55.1	54.7
Breaking Strength lbs/inch	Warp/Length	279	274	261
	Filling/Width	157	160	149
Breaking Strength Percent Loss	Warp/Length	53.50%	54.33%	56.50%
	Filling/Width	53.14%	54.29%	57.43%
Mullen Burst (lbs/sq inch)		348	352	341
Mullen Burst (percent Loss)		57.82%	57.33%	58.67%
Flex Cycles (MIT Method)	Warp	17312	16894	16807
	Fill	1426	1398	1312
Flex Cycles Percent Loss	Warp	65.38%	66.21%	66.39%
	Fill	61.46%	62.22%	64.54%
Other Testing				

IP12_001462



prepared for: **INTERMOUNTAIN POWER**

Date : **10/19/200**

TLN : **140K**

Identification **1 A9-0-11**

Fiber Content: **ECDE**

Fabric Construction: **WOVEN**

Weave: **3 X 1 TWIL**

Count: **44 X 24**

Yarn System- Warp/Length: **37-1/0F**

Filling Width: **75-1/0F+75-1/2T**

Avg Weight [oz/sq yd]: **13.71**

Thickness [inches]: **.014**

Density Factor: **.0756**

Treatment- Physical Type: **NONE**

Chemical Type: **ACID RESISTANT**

% Ignition Loss [LOI]:

500° F/1 Hour **.004%**

1150° F/1 Hour: **4.31%**

% Extractable Matter **SULPHATES**

Acid Alkaline [PH]: **10.71**

Fabrication: **=====**

Seaming: **CHAIN**

Hardware: **C.R.**

Cuffing: **LOCK**

Sewing Thread: **E GLASS**

Ring Cover: **LOCK**

Fabrication Rating: **GOOD**

PROFILE DATA

		Top	Center	Bottom
Weight (oz/sq yd)	As Received	21.88	21.73	21.41
	Cleaned	17.90	17.69	17.19
	Cleaned (Washed)	13.69	13.74	13.70
Permeability CFM/sq ft @ .5" H2O	As Received	1.28	1.39	1.57
	Cleaned	5.2	5.3	5.5
	Cleaned (Washed)	53.2	48.9	49.7
Breaking Strength lbs/inch	Warp/Length	246	254	239
	Filling/Width	150	147	133
Breaking Strength Percent Loss	Warp/Length	59.00%	57.67%	60.16%
	Filling/Width	57.14%	58.00%	62.00%
Mullen Burst (lbs/sq inch)		339	343	327
Mullen Burst (percent Loss)		58.91%	58.42%	60.36%
Flex Cycles (MIT Method)	Warp	15832	15413	14102
	Fill	1242	1210	1093
Flex Cycles Percent Loss	Warp	68.68%	69.17%	71.80%
	Fill	66.43%	67.30%	70.46%
Other Testing				

IP12_001463

Environmental Consultant Company
dedicated to filtration science...

Laboratory Address:
2501 W. Behrend Drive, Suite 77
Phoenix, Arizona 85027

Mailing Address:
P.O. Box 42537
Phoenix, Arizona 85080

April 1, 2005
TLN 742J
Page 1

REPORT
INTERMOUNTAIN POWER SERVICE CORPORATION

Reference: Unit 2 Bag Evaluations

Two reverse air cleaning filter bags were received for testing and evaluations. The bags were in the same bag/box with the following outside labels: Unit 2 – 2B07 and Unit 2 – 2B09.

The bags have been in service from 10/96 and 9/97.

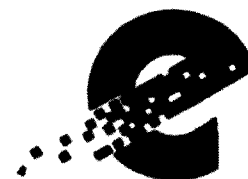
The specific location of the individual bags was not identified hence, bags can only be assigned as from Unit 2 with projected service use.

These bags yielded nominal levels of as received permeability readings. Examination of the fly ash cake structure revealed a generally porous formation with no significant level of agglomerations.

Photo A and B are views common to the full profile of the bags.

Telephone: 623-582-5155
Fax: 623-581-9264

E-mail: ecc@bagtest.com
Website: www.bagtest.com



IP12_001464

April 1, 2005
TLN 742 J
Page 3

There is no significant differences in nodula population indicative of no moisture encounters having occurred since the 10/96 installation date.

Cleaning flows generated good overall discharge characteristics with good elevations in permeability throughput.

The levels are common to both bags further indicative of no abnormal condition from the first 10/96 installation operating period to date.

Examination of the lines of collapse revealed good equal distant spacing and intensity resulting from good upward tensioning and good cleaning reverse air flow distribution through the compartments.

The media is at good ash collection characteristics with no significant fine micron dust penetration.

Photo C and D are views of the clean air side of the bags revealing very minimal levels of dust penetration.

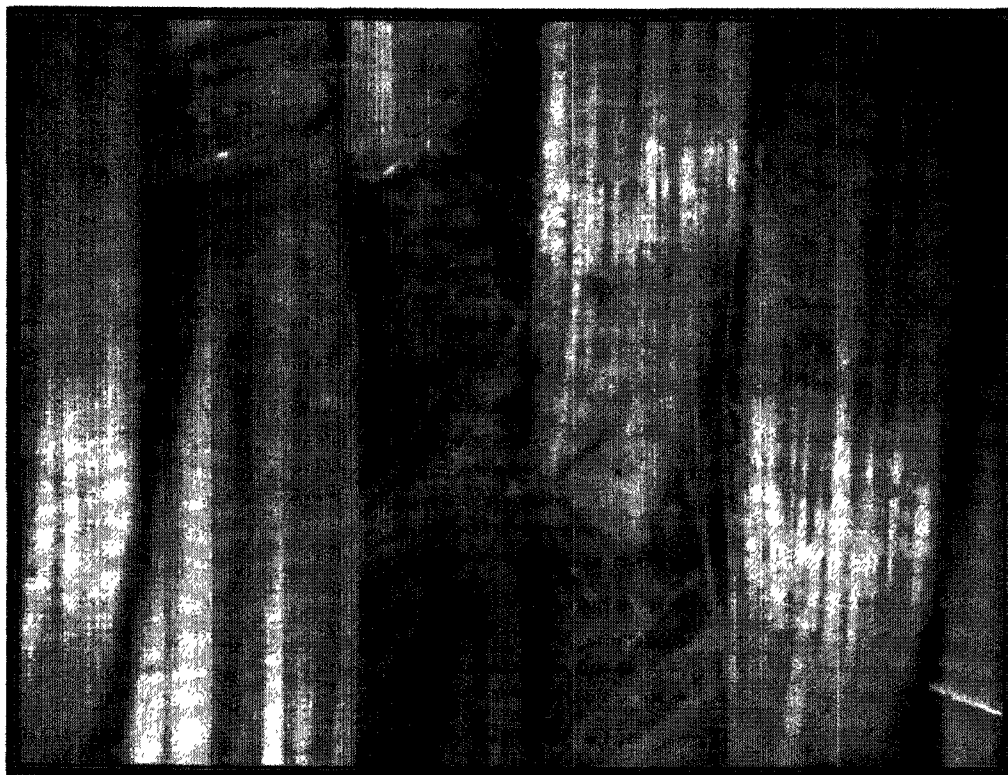


Photo C

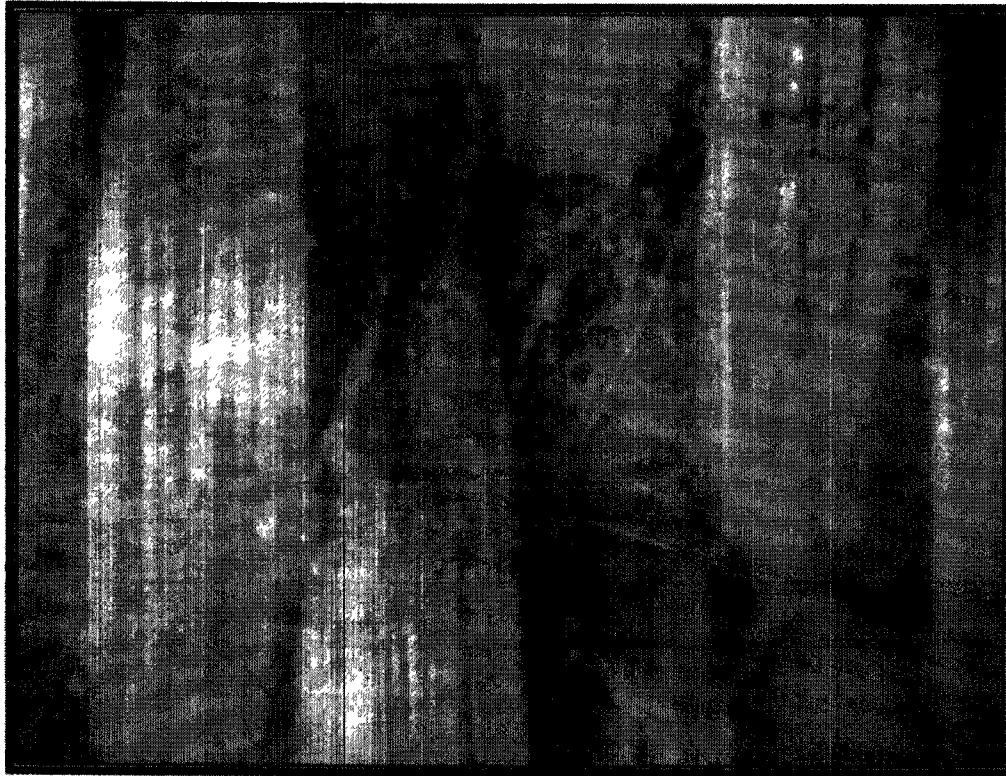


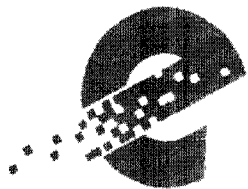
Photo D

Breaking strengths and mullen burst values are all at good levels of retention.

Flex cycles also indicative good levels of endurances.

These bags are rated at 65% to 70% maximum termination levels indicative of good further service use potential.

No abnormal wear or bag to bag contact is demonstrated.



prepared for: **INTERMOUNTAIN POWER**

Date : **4/1/2006**

TLN : **742 J**

Identification **UNIT 2-1**

Fiber Content: **ECDE**

Fabric Construction: **WOVEN**

Weave: **3 X 1 TWILL**

Count: **44 X 24**

Yarn System- Warp/Length: **37-1/0F**

Filling Width: **75-1/2T+75-1/0F**

Avg. Weight [oz/sq yd] **13.68**

Thickness [inches]: **.015**

Density Factor: **.704**

Treatment- Physical Type: **NONE**

Chemical Type:

% Ignition Loss [LOI]

500° F/1 Hour: **0.07%**

1150° F/1 Hour: **4.42%**

% Extractable Matter: **SULPHATES**

Acid Alkaline [PH]: **9.93**

Fabrication

Seaming: **CHAIN**

Hardware: **CR**

Cuffing: **LOCK**

Sewing Thread: **E GLASS**

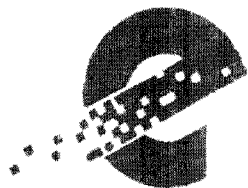
Ring Cover: **LOCK**

Fabrication Rating: **GOOD**

PROFILE DATA-

		Top	Center	Bottom
Weight (oz/sq yd)	As Received	23.74	23.46	23.29
	Cleaned	19.51	19.37	19.11
	Cleaned (Washed)	13.68	13.65	13.69
Permeability CFM/sq ft @ .5" H2O	As Received	2.91	2.99	3.09
	Cleaned	6.8	7.0	7.6
	Cleaned (Washed)	43.7	44.9	42.0
Breaking Strength lbs/inch	Warp/Length	283	284	229
	Filling/Width	165	163	153
Breaking Strength Percent Loss	Warp/Length	43.40%	43.20%	54.20%
	Filling/Width	52.85%	53.43%	56.86%
Mullen Burst (lbs/sq inch)		359	362	347
Mullen Burst (percent Loss)		52.13%	51.73%	53.73%
Flex Cycles (MIT Method)	Warp	18314	17981	16938
	Fill	4199	4226	3679
Flex Cycles Percent Loss	Warp	63.37%	64.04%	60.12%
	Fill	58.01%	57.74%	63.21%
Other Testing				

IP12_001467



prepared for. **INTERMOUNTAIN POWER**

Date : **4/1/2005**

TLN : **742 J**

Identification **UNIT 2-2**

Fiber Content: **ECDE**

Fabric Construction: **WOVEN**

Weave: **3 X 1 TWILL**

Count: **44 X 24**

Yarn System- Warp/Length: **37-1/0F**

Filling Width: **75-1/4F+75-1/2T**

Avg. Weight [oz/sq yd]. **13.54**

Thickness [inches]: **.014**

Density Factor: **.745**

Treatment- Physical Type: **NONE**

Chemical Type: **AR**

% Ignition Loss [LOI]

500° F/1 Hour: **0.11%**

1150° F/1 Hour: **4.63%**

% Extractable Matter: **SULPHATES**

Acid Alkaline [PH]: **10.01**

Fabrication (****)

Seaming: **CHAIN**

Hardware: **CR**

Cuffing: **LOCK**

Sewing Thread: **E GLASS**

Ring Cover: **LOCK**

Fabrication Rating: **GOOD**

PROFILE DATA

		Top	Center	Bottom
Weight (oz/sq yd)	As Received	23.88	23.64	23.51
	Cleaned	19.60	19.41	19.28
	Cleaned (Washed)	13.51	13.68	13.44
Permeability CFM/sq ft @ .5" H2O	As Received	2.74	2.83	3.00
	Cleaned	6.7	6.9	7.5
	Cleaned (Washed)	47.5	47.1	48.3
Breaking Strength lbs/inch	Warp/Length	264	261	217
	Filling/Width	156	157	147
Breaking Strength Percent Loss	Warp/Length	47.00%	47.80%	56.60%
	Filling/Width	55.43%	55.14%	58.00%
Mullen Burst (lbs/sq inch)		349	351	337
Mullen Burst (percent Loss)		53.47%	53.20%	55.07%
Flex Cycles (MIT Method)	Warp	17421	16943	15838
	Fill	4070	3753	3049
Flex Cycles Percent Loss	Warp	65.16%	66.11%	68.32%
	Fill	59.30%	62.47%	69.51%
Other Testing				

IP12_001468

Response 12
IGS03-02 Air Heater Element Replacement
Bret Kent

Baghouse Rebag Study